APPENDIX A

SECTION I: Traffic Impact Analysis (TIA) Required

General Information

The Traffic Impact Analysis (TIA) is a specialized study that evaluates the effects of a development's traffic on the surrounding transportation infrastructure. It is an essential part of the development review process to assist developers and local government agencies in making land use decisions involving annexations, subdivisions, rezoning requests, special land uses, and other development reviews. The TIA helps identify where the development may have a significant impact on safety, traffic and transportation operations and provides a means for the developer and the government agencies to mitigate these impacts. Ultimately, the TIA can be used to evaluate if the scale of the development is appropriate for a particular site and what improvements may be necessary, on and off the site, to provide safe and efficient access and traffic flow. Mitigation measures may involve strategies other than roadway construction or other physical improvements such as changes to traffic signal timing or phasing and transportation management strategies.

When A TIA Is Required

- A TIA shall be required for residential developments proposed within Cabarrus County that have an estimated trip generation of 2,000 vehicles per day or greater during an average weekday based on a five day national average as defined in the Institute of Transportation Engineers (ITE) Trip Generation Manual.

- A TIA shall be required for commercial type developments proposed within Cabarrus County with an estimated trip generation of 3,000 vehicles per day or greater during an average weekday based on a five day national average as defined in the Institute of Transportation Engineers (ITE) Trip Generation Manual.

- A TIA shall be required for mixed-use developments proposed within Cabarrus County with an estimated trip generation of 3,000 vehicles per day or greater during an average weekday based on a five day national average as defined in the Institute of Transportation Engineers (ITE) Trip Generation Manual.

- A TIA may also be required for proposed accesses within 1,000 feet of an interchange, in the vicinity of a high accident location, on a major arterial roadway, when involvement with an existing or proposed median crossover is necessary, when the project includes highway improvements that are in the Transportation Improvement Program, when involvement with an active roadway construction project is necessary or at the discretion of the District Engineer working with Cabarrus County.

In certain instances, the need for a TIA may be waived when Cabarrus County and NCDOT agree a TIA is not needed. In the event a waiver is requested, the applicant must provide evidence to show that a waiver is appropriate. Waiver requests shall be handled on a case-by-case basis.

Calculating Trip Generation

The trip generation of a proposed development is the sum of the number of inbound and outbound vehicle trips that are expected for the type and size of the proposed land use. For purposes of determining the requirement to submit a TIA, no adjustments such as modal split, pass-by trips or internal capture rates will be allowed to the site traffic calculation. A TIA will vary in range and complexity depending on the type and size of the proposed development. When mutually agreed upon by the NCDOT, the applicant, and Cabarrus County staff, the basic requirements for the TIA may be modified.

TRAFFIC IMPACT STUDY GUIDELINES

A. General Information

When required by this Ordinance and/or NCDOT, a Traffic Impact Analysis (TIA) shall be used to review the potential impacts of proposed or revised developments on the State Highway System. The TIA covers safety, capacity, and access issues. When required and completed, a TIA shall be used by Cabarrus County and NCDOT to determine the required improvements to the State Highway System within the vicinity of the development to mitigate undesirable impacts of the project.

The District Engineer, working together with Cabarrus County, will determine the basic parameters of the TIA. When mutually agreed upon by the NCDOT, the applicant, and Cabarrus County in a pre-submittal conference, the basic requirements and parameters for the TIA may be modified.

The TIA shall be prepared under the direct charge of, and sealed by, a licensed North Carolina Professional Engineer with expertise in traffic engineering. All work shall be in accordance with NCDOT approved methods and input parameters and shall be of sufficient scope and detail to allow Cabarrus County and the NCDOT to evaluate the impact of the development with regards to roadway capacity and operational and safety improvements that may be needed.

B. Format for Traffic Impact Analysis Report

In general, the report should conform to the following general outline:

1. Table of Contents
2. Introduction
    a. Explanation of project
    b. Area map showing development site location
    c. Complete project site plan, with buildings identified as to proposed use
    d. Project schedule, and stages or phases, if applicable
3. Base Conditions
    a. Existing Roadway network in vicinity of project, including lane configurations
    b. Availability of alternate modes of travel in study area
    c. Existing traffic volumes for all significant and pertinent modes of travel in the study area
    d. Existing traffic signal phasing and timing information.
    e. Safety information
    f. Traffic capacity analysis
4. Background Conditions
    a. Growth in traffic volumes to full build-out year, or stages of developments, if appropriate
    b. Traffic volume generated by other approved developments in area, if applicable
    c. Transportation improvement projects (State, local or private) in project study area
    d. Background traffic volumes (base + growth + approved developments)
    e. Traffic capacity analysis
5. Project Conditions
    a. Traffic generated by proposed development (site traffic) at build-out, or stages of developments, if appropriate
    b. Project traffic volumes (background + project)
    c. Project traffic analysis
    d. Impact to alternate modes of travel
    e. Proposed roadway network improvements
    f. Project traffic analysis with proposed roadway improvements
6. Conclusions/Recommendations
7. Appendix
    a. All work sheets, traffic counts and other pertinent documents

C. Base Roadway Network

All roadways in the vicinity of the development shall be included as part of the TIA. Analysis of intersections or roadway segments not immediately adjacent to the development may be required by the District Engineer or Cabarrus County if significant site traffic could be expected to impact the intersection or roadway segment. If intersections impacted by the development are within a coordinated traffic signal system, then the entire traffic signal system shall be analyzed. However, if the traffic signal system is large, a sub-section of the system may be analyzed if approved by the District Engineer and agreed upon by Cabarrus County.

D. Safety Information

The initial submittal may be required to include recent crash experience in the study area. Where proposed access points are in the vicinity of high crash locations or where safety may be impacted, additional safety studies may be required as part of the Traffic Impact Analysis.

E. Traffic Volumes

Traffic turning movement counts shall be taken at each existing intersection in the project area. Existing traffic counts may be used if taken within twelve months of the TIA submittal. At some intersections, counts older than one year may be used if adjusted to current year. The use of these older counts will be evaluated on a case-by-case basis by the NCDOT and Cabarrus County and shall be approved by the District Engineer or his or her agent.

In general, AM and PM peak hour counts should be used. Other peak hour period counts, such as lunch and weekend periods, may be required if appropriate for the development. Counts shall not be taken on a holiday unless specifically needed for the particular analysis. The effects of school, seasonal variation and special event traffic shall be noted when appropriate.

F. Traffic Capacity Analysis

All capacity analysis shall be performed using methodology and software based on the Highway Capacity Manual procedures or as approved by the NCDOT District Engineer. All software shall be the latest version available unless otherwise approved by the District Engineer. If signalized intersections impacted by the project are within a coordinated traffic signal system, or may be included in a system because of changes to the network by the applicant, then they shall be analyzed as a system rather than as isolated intersections. Where available and appropriate, existing timing information shall be used. All analyses shall include level of service determination for the entire network and individual intersections and roadway segments, as appropriate. Intersection analyses shall include level of service determinations for all approaches and movements. Intersection analyses shall include queue analysis.

G. Growth-to-Background Traffic Volumes

Growth-to-background traffic volumes are factors of increases in annual traffic volumes generated outside the project area. These factors shall be applied to the existing traffic before adding any approved developments in the area. As deemed appropriate, the volume shall be compounded to the proposed build-out years or completion of development stages. In general, these factors will be determined from local or statewide data.

H. Approved Development Traffic

Approved development traffic is defined as traffic generated by all developments approved by local jurisdictions or submitted to local jurisdictions for approval within the development vicinity at the time of the TIA submittal.

I. Background Analysis

Background (no build) analysis shall include existing traffic, traffic signal phasing and timing, background growth, and all approved developments. The analysis shall take into consideration any improvements to the roadway network that will be in place by the build-out year, or staged build-out in development, as appropriate. An analysis shall be performed for each staged build-out year as necessary. This analysis shall

be performed for the proposed build-out year of the development or other year as identified by Cabarrus County or NCDOT and approved by the District Engineer.

J. Project Conditions

Site traffic is the traffic that will be generated by the proposed development. Trip generation rates shall be based on trip generation methodology in the latest version of the "Trip Generation Manual" by the ITE. When approved by the District Engineer, available local information may be substituted with appropriate documentation. The District Engineer may coordinate the analysis of the site trip generation with the Division Traffic Engineer. Trip generation reduction factors, such as pass-by traffic and internal capture, shall be justified. Total traffic is to be re-calculated after site traffic is generated. All trip generation calculations and supporting documentation shall be included in the report appendix. Project traffic analysis shall include any roadway network improvements that will be in place by the project build-out year, or stage in development, if appropriate. Any improvements planned by others shall be identified as such and documentation describing the improvements, the entity that is to implement the improvements, and the schedule for such improvements, shall be provided.

K. Roadway Network Improvements

The applicant shall be required to identify mitigation improvements to the roadway network if at least one of the following conditions exists when comparing base network conditions to project conditions:

- The total average delay at an intersection or individual approach increases by 25% or greater;
- The Level of Service (LOS) degrades by at least one level;
- Or the Level of Service (LOS) is an "F."

For turning lanes, mitigation improvements shall be identified when the analysis indicates that the 95th percentile queue exceeds the storage capacity of the existing lane. The District Engineer will be responsible for final determination of mitigation improvements required to be constructed by the applicant.

L. Conclusions/Recommendations

This section of the TIA shall summarize the findings of the analysis, identify all potential intersections or roadway segments that will be at an unacceptable level of service as identified in Section J, and shall identify all proposed improvements to mitigate potential problems. This includes a description of all of the improvements that the developer shall construct (or fund) as part of the development proposal. Improvements to roadway segments and intersections not immediately adjacent to the project site may be required if significant traffic impacts are identified.

M. Supporting Information

The applicant shall provide all supporting information to the District Engineer and Cabarrus County. This information may include but is not limited to the following:

- traffic volumes;
- analysis reports;
- signal warrant analysis;
- documentation of approved developments or proposed roadway improvements by others;
- and analysis data and output.

In lieu of printed pages, electronic copies of supporting data may be submitted. The submitted information may include data from traffic analysis, traffic volume, or signal warrant analysis software packages. If submitted, both input data and output reports shall be included. Data files should be named to facilitate identification of the contents.

All plans may be submitted electronically, with the exception that a copy of the proposed site plan must be printed and included with the application. If so provided, the plans must be in a format approved by the District Engineer and Cabarrus County.

N Final Submittal information

Once the TIA is approved by NCDOT and Cabarrus County, one (1) electronic copy of the entire TIA on CD and one (1) paper copy of the TIA shall be submitted to the Cabarrus County Planning Department for the project file.

O. Validity of TIA

Residential Projects

- A TIA shall be valid for a period of two (2) years from the date of the preliminary approval by the Planning and Zoning Commission.

Commercial Projects

- In the case of commercial projects, if a preliminary plat is required for the project, the TIA shall be valid for a period of two (2) years from the date of the preliminary plat approval by the Planning and Zoning Commission.
- In the event a preliminary plat is not required for the project and the project is subject to site plan review only, then the TIA shall be valid for a period of two (2) years from the date of site plan approval by Cabarrus County Zoning Services.

Mixed Use Projects

- Where Mixed Use projects are proposed, the TIA shall be valid for a period of two (2) years from the date of preliminary plat approval by the Planning and Zoning Commission or site plan approval by Cabarrus County Zoning Services, whichever occurs first.

SECTION 2: Improvements Required (Projects Not Requiring TIA)

If a project does not require a Traffic Impact Analysis to be performed, the developer/project owner is not exempt from completing improvements to mitigate the impacts of the proposed project. For the project to take place, highway infrastructure improvements may be necessary. For example, improvements may be needed for safe and efficient traffic operations if there are high roadway and/or turning volumes of traffic, when the roadway speeds are moderate or high or where limited sight distance exists.

A. Infrastructure Improvements Defined

Highway infrastructure improvements include, but are not limited to:

- additional through lanes
- acceleration lanes
- turn lanes and tapers for left and right turns associated with a driveway connection.

As set forth in G.S. 136-18(29), the final determination for the need, extent, location and design of turn lanes is the responsibility of the NCDOT. The NCDOT may require the applicant to provide offsite roadway improvements on public facilities in order to mitigate any negative traffic impacts created by the proposed development. Boundaries for offsite improvements, including intersections and public roadways to be considered, will be determined by the District Engineer in cooperation with Cabarrus County.

B. Right-Of-Way Acquisition

When adequate right-of-way does not exist to provide for the required offsite improvements necessary to maximize the safety of the traveling public, the applicant shall secure the needed right-of-way. If the applicant is unsuccessful in obtaining the needed right-of-way and has demonstrated a "good-faith effort," the NCDOT may, but shall not be required to, utilize its power of eminent domain to secure adequate right-of-way to contain the required improvements. At a minimum, a "good-faith effort" shall consist of a copy of a certified letter to all affected property owners and all responses received from those property owners. The applicant shall provide copies of the documentation sent to affected property owners and any responses received to Cabarrus County Planning Services for the project file. In the event the ROW acquisitions services of NCDOT are required for the project, the applicant shall be required to reimburse all costs incurred by NCDOT to acquire the additional right-of-way.

C. Local Transportation Plans and Future Right-Of Way

In conjunction with the driveway request, the NCDOT and/or Cabarrus County may require the applicant to reserve or dedicate minimum right-of-way needs as identified by local government transportation plans for the state-maintained roadway along the property frontage. This may require that the driveway design and internal circulation be compatible with the future right-of-way location.

D. Left and Right Turn Lanes

Generally left and right turn lanes and tapers shall be considered when:

- In accordance with G.S. 136-18(29), the average daily traffic meets or exceeds 4,000 vehicles per day on any secondary route (the average daily traffic should include both the existing traffic plus traffic generated by the proposed development);
- Any US or NC numbered route is being accessed;
- The District Engineer determines that such treatment is necessary to avoid congestion or unsafe conditions on the state-maintained roadway; or
- A TIA identifies a need for an auxiliary lane or taper.

Left and right turn lanes shall be constructed in accordance with the "North Carolina Standards and Specifications for Roads and Structures." On an undivided highway or a divided highway with a median width that is inadequate for a left-turn lane, it may be necessary to widen the highway in order to provide for the required turn lanes. For greater detail, see the turn lane nomograph figure in the Exhibits section of the "Policy on Street and Driveway Access to North Carolina Highways." Should widening be required to accommodate turn lanes or tapers, the applicant shall be required to acquire the necessary ROW as stated in Section B, Right-of-Way Acquisition.

E. Channelization

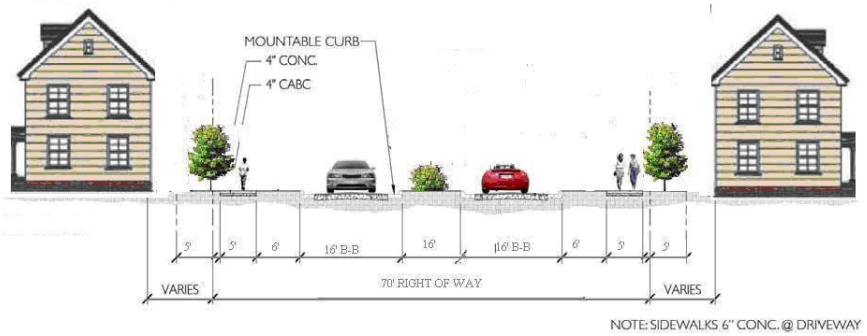
The applicant may be required to protect the integrity of the highway network by providing channelization to physically prevent improper or illegal turns into and out of a driveway or street. Channelization may include medians and raised traffic islands with curbs.

F. Authority

The District Engineer has final authority on decisions regarding infrastructure improvements and shall inform Cabarrus County of any such decisions regarding infrastructure improvements.

TYPICAL STREET STANDARDS

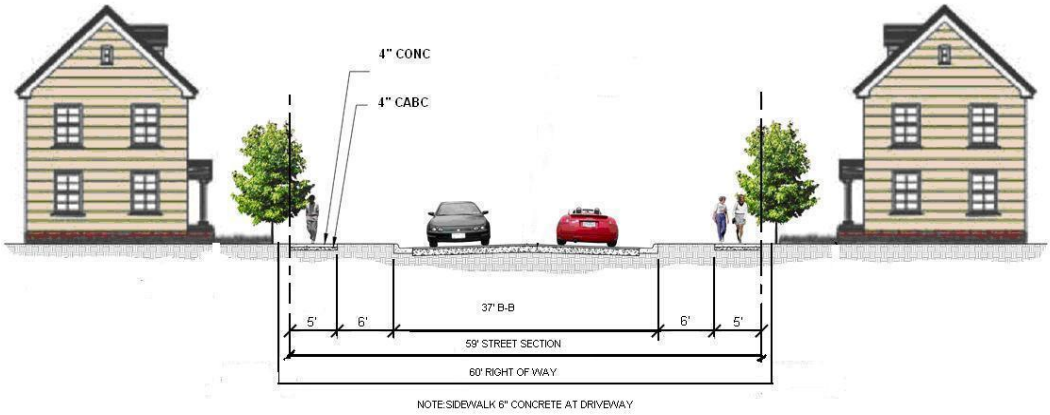
RESIDENTIAL COLLECTOR
(PARKWAY)



Right-of-Way	Sidewalks	Planting Strips	Street Width	Median	Parking	Design Speed	Curb Type
70’	5’	6’	2 x 16’	16’	None	40 mph	30” Standard

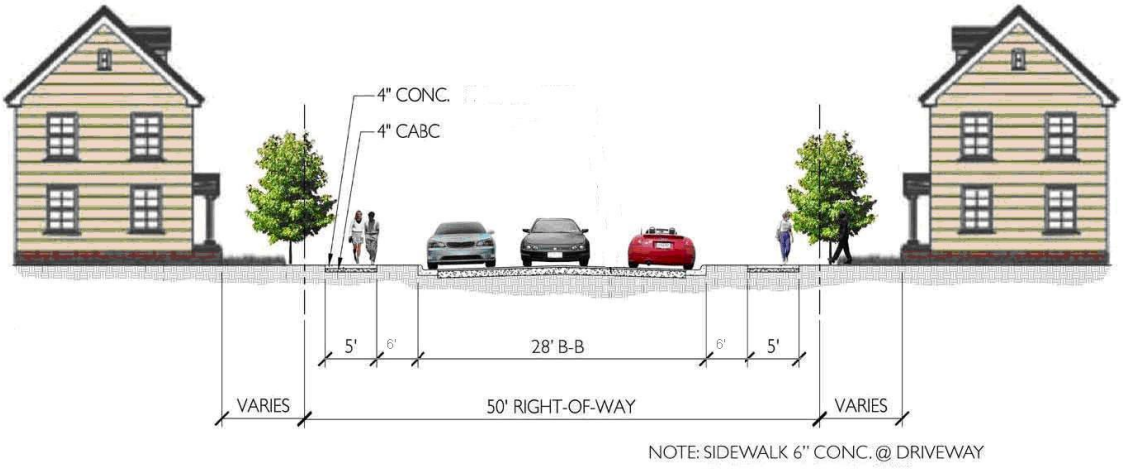
- NO DIRECT LOT ACCESS ALONG RESIDENTIAL COLLECTOR (PARKWAY)
- THE MEDIANS OF THE PARKWAY SHALL TERMINATE 100′ EACH WAY FROM THE CENTERLINE OF ALL INTERSECTIONS

RESIDENTIAL COLLECTOR



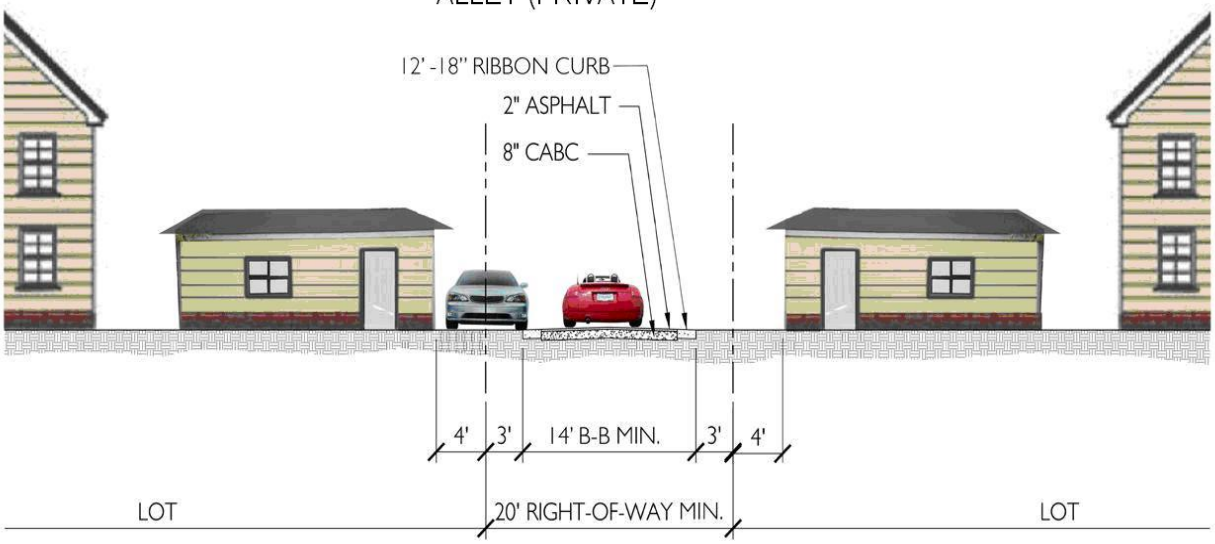
Right-of-Way	Sidewalks	Planting Strips	Street Width	Parking	Design Speed	Curb Type
60’	5’	6’	37’	One Side	40 mph	30” Standard

RESIDENTIAL STREET



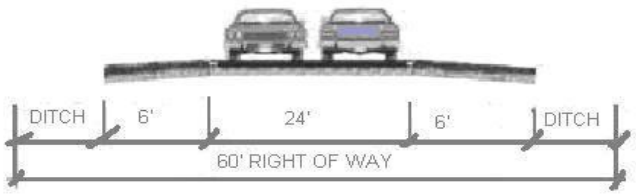
Right-of-Way	Sidewalks	Planting Strips	Street Width	Parking	Design Speed	Curb Type
50’	5’	6’	28’	One	35 mph	Standard or Valley

ALLEY (PRIVATE)



Right-of-Way	Grass Strips	Street Width	Curb Type
20’	3’	14’	Ribbon Or None

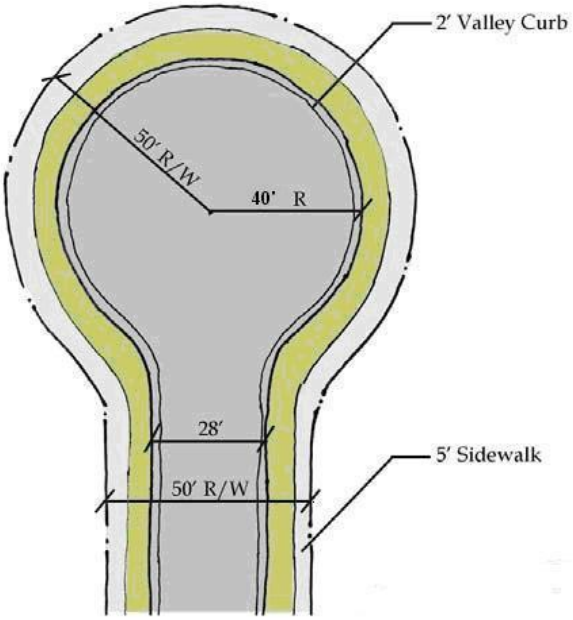
Rural Residential Street



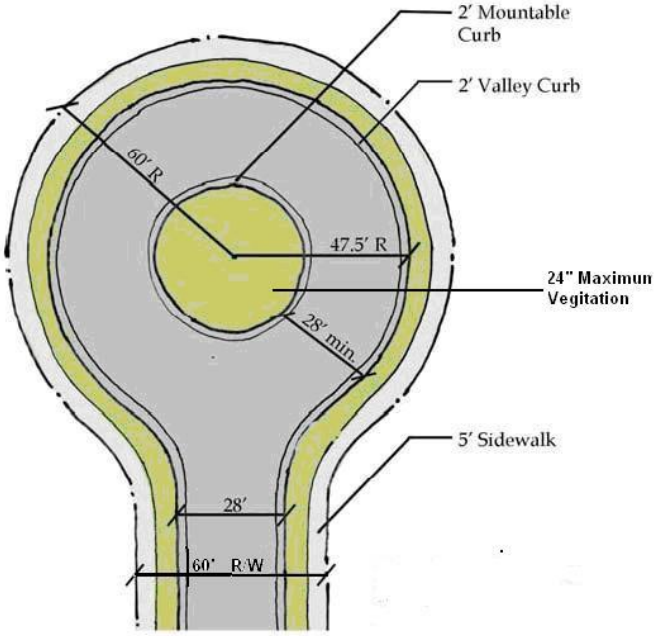
Right-of-Way	Planting Strips	Street Width	Parking	Design Speed	Curb Type
60’	6’	24’	None	20 mph	Ribbon or None

Requirements for Dead-End and Stub Streets

Length (feet)	Width (feet)	Turnaround Required
0 to 150	Varies (28’ minimum)	**Stub Street:** None required **Cul-de-Sac:** 80’ diameter **Hammerhead:** 60’ stub-see detail (rural and suburban tiers)
151 to 400	Varies (28’ minimum)	**Stub Street:** 80’ temporary cul-de-sac or 60’ hammerhead (all weather surfaced) **Cul-de-Sac:** 95’ diameter (rural and suburban tiers) **Hammerhead:** Not allowed
401 to 600	Varies (28’ minimum)	**Stub Street:** Not allowed **Cul-de-Sac** (suburban tier): 95’ diameter with center island **Hammerhead:** Not allowed
601-1,000 (rural tier only)	Varies (22’ minimum)	**Stub Street:** Not allowed **Cul-de-Sac** (rural tier)**:** 95’ diameter with center island **Hammerhead:** Not allowed
> 1,000	Not allowed	Not allowed



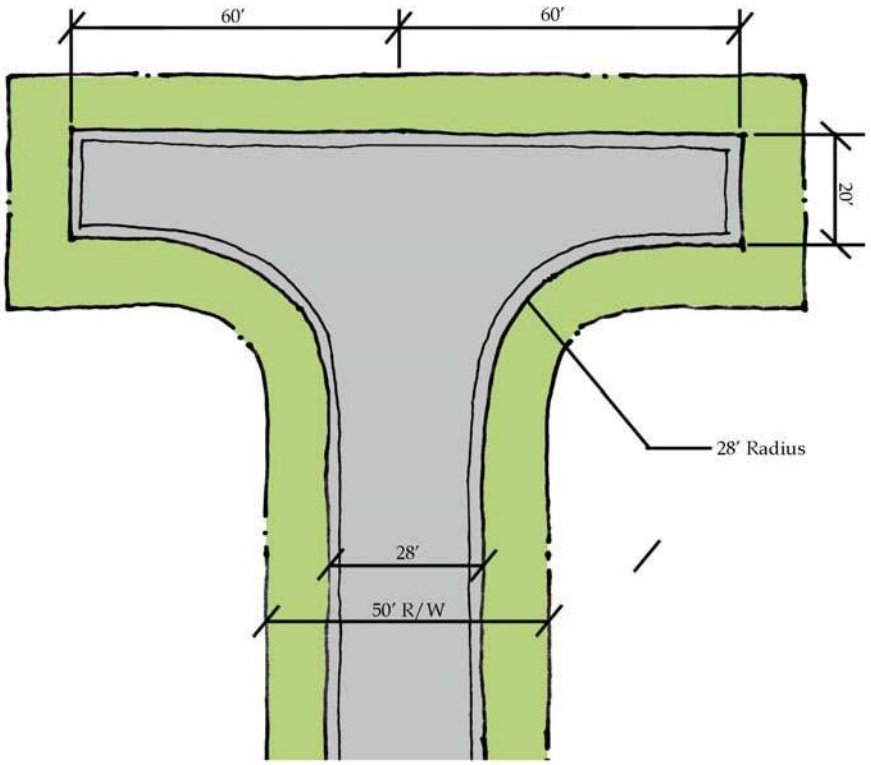
Cul-de-Sac



Cul-de-Sac with Island

NOTES:

- VEGETATION WITHIN MEDIANS AND/OR PLANTING STRIPS CAN NOT EXCEED 24' IN HEIGHT
- VEGETATION IN MEDIAN/PLANTING STRIP IS TO BE MAINTAINED BY OWNERS, HOME OWNER'S ASSOCIATION OR OTHERS
- ALL PLANTINGS SHOULD CONFIRM TO THE NCDOT PUBLISHING TITLED "GUIDELINES FOR PLANTINGS WITHIN HIGHWAY RIGHT OF WAY"



Hammerhead

PAVEMENT SCHEDULE

Classification		Base Course	Intermediate Course	Surface Course
Major Thoroughfare	All	*	*	*
Minor Thoroughfare	All	*	*	*
Major Collector	Non-Residential	*	*	*
	Residential	10” CABC or 5” B-25.0X	2.25” I-19.0X	2.0” SF 9.5X
Minor Collector	Non-Residential	*	*	*
	Residential	10” CABC or 5” B-25.0X	2.25” I-19.0X	2.0” SF 9.5X
Local Street	Non-Residential	*	*	*
	Residential	8” CABC or 4” B-25.0X	2.25” I-19.0X	2.0” SF 9.5X
Alley	All	8”CABC		2.0” SF 9.5X

* Pavement cross sections must be designed on a case by case basis.